UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/817,622	03/26/2001	Anwar Chitayat	99AN122-E	8382

7590 04/23/2003

Rockwell Automation/Allen-Bradley Co., Inc.
John J. Horn, Esq.
Patent Department/704P Floor 8-T29
1201 South Second Street
Milwaulkee, WI 53204

EXAMINER	
MULLINS, BURTON S	

ART UNIT	PAPER NUMBER
2834	

DATE MAILED: 04/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application No. 09/817,622	Applicant(s) CHITAYAT ET AL.
	Examiner Burton S. Mullins	Art Unit 2834

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 15 January 2003 .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-21 is/are pending in the application.

4a) Of the above claim(s) ______ is/are withdrawn from consideration.

5)☐ Claim(s) ______ is/are allowed.

6)☒ Claim(s) 1-21 is/are rejected.

7)☐ Claim(s) ______ is/are objected to.

8)☐ Claim(s) ______ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on ______ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on ______ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. ______ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ______ .
4) ☐ Interview Summary (PTO-413) Paper No(s). ______ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1-2, 4, 7-10 and 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kemmer (US 4,234,831) in view of Spinner et al. (US 5,771,174) and Mizutani (US 5,532,533). Kemmer teaches an integrated rotary-linear actuator system, comprising: a plunger (rotor 3) movable along and rotatable about a longitudinal axis extending through the plunger (and shaft 6); a coil system having coils S1-S8 arranged to, when energized, interact with the plunger to move the plunger in at least one of a rotational mode and in a linear mode (abstract); an amplifier (part of inverter with outputs A1-A8; Fig.4) coupled to the coils and operative to provide electrical energy to energize the coils; and a control system coupled with the amplifier (converter/decoder with input; Fig.4). Kemmer does not teach: 1) a network interface operative to receive control information from the actuator; and 2) the control system and associated rotary-linear motor "integrated into an single module."

Regarding (1), Spinner teaches a distributed intelligence control system for controlling plural actuators 26 (Fig.2) and respective controllers 30 connected by connections 32 with a network bus 24 and gateway or "network interface" 22 (Fig.1). The network interface interprets messages from the supervisory control system (computer) 20 and converts and distributes this information to the actuator controllers. The network interface also converts and transmits information originating from the actuator, e.g., position and status, to the control

system (c.4, lines 23-30). Such a LAN network as in Spinner is desirable as a means of communication between a central host controller and a series of actuators (c.2, lines 49-52).

Regarding (2), Mizutani teaches a servo motor integral with its control apparatus. Specifically, printed circuit board 58 is fitted to a portion extending in the radial direction of bearing 5 from the housing 51b and is loaded with power circuit 31 and signal processing circuit 24. A printed circuit board 60 is layered with the printed circuit 58 via a spacer 33 and is loaded with control circuit 32 and fixed to chassis 51 (c.6, lines 42-49). Among other advantages (c.11, lines 6-67), the integration of the control with the motor does not require sockets and terminals (c.8, lines 41-43); the heat generated by switching loss, etc., of the transistors in the power circuit may be transmitted to cooling fins, to improve cooling efficiency (c.8, lines 53-59); and water and/or oil is prevented from entering parts of the circuit (c.9, lines 16-20; 30-41).

It would have been obvious to one of ordinary skill at the time of the invention to modify Kemmer and provide: 1) a network interface per Spinner since this would have been a desirable means of establishing communication between a central host and an actuator; and 2) an integrated control system and associated rotary-linear motor into an single module per Mizutani since this would have been desirable to facilitate assembly, improve cooling efficiency and prevent water and/or oil from entering.

Regarding claims 2 and 16, though Kemmer teaches only one magnet or "motor", duplication of parts of an invention, i.e., providing an "array of magnets" such that plural motors are provided, has been held to involve ordinary skill. St. Regis Paper Co. v. Bemis Co. 193 USPQ 8, (7th Cir.1977).

Regarding claim 4, the motor support (tube 7) in Kemmer comprises a bearing support and a housing that define a well operative to receive the plunger (rotor 3), the plunger being supported by bearings 4 located between the plunger and the bearing support, such that the plunger is axially movable along the longitudinal axis between a retracted position and an extended position and rotatable about the longitudinal axis (Fig.1).

Regarding claims 9-10, the actuator controllers in Spinner comprise "sensors" since they transmit actuator information, e.g., position and status, to the host control system. The host includes program data operative to program operating characteristics of at least part of the integrated rotary-linear actuator system based on evaluation of the condition data from the integrated rotary-linear actuator system (c.7, line 9-c.8, line 34).

Regarding claim 17, Spinner includes a method for controlling plural actuators including a network interface to enable communication over an associated network, the method comprising: receiving control information (from host 20) at the network interface of the integrated rotary-linear actuator system via the associated network; and programming operating parameters of the rotary-linear actuator system based on the received control information (various parameters of the control algorithm are shown in c.6, lines 44+).

Regarding claim 18, the communications interface of Spinner including a network interface card (c.5, lines 1-28) would use a network protocol. Regarding claim 19, the control information includes program data, the operating parameters of the rotary-linear actuator system being programmed based on the program data (c.6, lines 5+). Regarding claim 20, Spinner's system senses conditions, e.g. position and state, of the actuators and provides a sensor signal indicative of the sensed at least one condition, which is sent from the actuator to

the computer 20 via the network interface 22 using the network protocol. Regarding claim 21, the control information includes program data (algorithm parameters given in c.6, line 44+) to program the operating parameters of at least part of the actuator based on evaluation of the condition data sent from the actuator.

3. Claims 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo et al. (US 4,644,205) in view of Spinner et al. (US 5,771,174) and Mizutani (US 5,532,533). Sudo teaches a rotary-linear actuator system, comprising: a motor support (stationary member 12) having a well (Fig.2); a plunger (floating member 14) supported for movement in at least part of the well so as to enable axial movement of the plunger relative to the well along a longitudinal axis of the plunger and rotational movement of the plunger about the longitudinal axis; an array of magnets (34a-34d/36a-36d) associated with the plunger (Fig.2); a first set of coils 42/44 (Fig.2) arranged to, when energized, apply an electric field that interacts with the array of magnets and provides an axial force to drive the plunger element in a linear mode (c.3, line 32); a second set of coils 50a-50h (Fig.2) arranged to, when energized, apply an electric field that interacts with the array of magnets and provides a tangential force to drive the plunger element in a rotational mode (c.3, line 47); and an integrated control system 66 which selectively energizes the first and second sets of coils to effect movement of the plunger in at least one of the linear and rotational modes.

Sudo does not 1) have a network interface operative to receive control information via an associated network, or 2) "integrate" the control system and an associated rotary-linear motor "into an single module."

Regarding (1), Spinner teaches a distributed intelligence control system for controlling plural actuators 26 (Fig.2) and respective controllers 30 connected by connections 32 with a network bus 24 and gateway or "network interface" 22 (Fig.1). The network interface interprets messages from the supervisory control system (computer) 20 and converts and distributes this information to the actuator controllers. The network interface also converts and transmits information originating from the actuator, e.g., position and status, to the control system (c.4, lines 23-30). The network interface also converts and transmits information originating from the actuator, e.g., position and status, to the control system (c.4, lines 23-30). Such a LAN network as in Spinner is desirable as a means of communication between a central host controller and a series of actuators (c.2, lines 49-52).

Regarding (2), Mizutani teaches a servo motor integral with its control apparatus. Specifically, printed circuit board 58 is fitted to a portion extending in the radial direction of bearing 5 from the housing 51b and is loaded with power circuit 31 and signal processing circuit 24. A printed circuit board 60 is layered with the printed circuit 58 via a spacer 33 and is loaded with control circuit 32 and fixed to chassis 51 (c.6, lines 42-49). Among other advantages (c.11, lines 6-67), the integration of the control with the motor does not require sockets and terminals (c.8, lines 41-43); the heat generated by switching loss, etc., of the transistors in the power circuit may be transmitted to cooling fins, to improve cooling efficiency (c.8, lines 53-59); and water and/or oil is prevented from entering parts of the circuit (c.9, lines 16-20; 30-41).

It would have been obvious to one of ordinary skill at the time of the invention to modify Sudo and provide: 1) a network interface per Spinner since this would have been a

desirable means of establishing communication between a central host and an actuator; and 2) an integrated control system and associated rotary-linear motor into an single module per Mizutani since this would have been desirable to facilitate assembly, improve cooling efficiency and prevent water and/or oil from entering.

Regarding claim 12, the communications interface of Spinner including a network interface card (c.5, lines 1-28) would use a network protocol. Regarding claim 13, the control information includes program data, the operating parameters of the rotary-linear actuator system being programmed based on the program data (c.6, lines 5+). Regarding claim 14, Spinner's system senses conditions, e.g. position and state, of the actuators and provides a sensor signal indicative of the sensed at least one condition, which is sent from the actuator to the computer 20 via the network interface 22 using the network protocol. Regarding claim 15, the control information includes program data (algorithm parameters given in c.6, line 44+) to program the operating parameters of at least part of the actuator based on evaluation of the condition data sent from the actuator.

4. Claims 1-10 and 16-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo et al. (US 4,644,205) in view of Spinner et al. (US 5,771,174), Gerard (US 4,751,437) and Mizutani (US 5,532,533). Sudo teaches a rotary-linear actuator system, comprising: a motor support (stationary member 12) having a well (Fig.2); a plunger (floating member 14) supported for movement in at least part of the well so as to enable axial movement of the plunger relative to the well along a longitudinal axis of the plunger and rotational movement of the plunger about the longitudinal axis; an array of magnets (34a-34d/36a-36d) associated with the plunger (Fig.2); a first set of coils 42/44 (Fig.2) arranged to, when energized, apply an

electric field that interacts with the array of magnets and provides an axial force to drive the plunger element in a linear mode (c.3, line 32); a second set of coils 50a-50h (Fig.2) arranged to, when energized, apply an electric field that interacts with the array of magnets and provides a tangential force to drive the plunger element in a rotational mode (c.3, line 47); and an integrated control system 66 which selectively energizes the first and second sets of coils to effect movement of the plunger in at least one of the linear and rotational modes.

Sudo does not teach: 1) a network interface operative to receive control information via an associated network; 2) an amplifier; and 3) a control system "integrate[d]" with the associated rotary-linear motor "into an single module."

Regarding (1), Spinner teaches a distributed intelligence control system for controlling plural actuators 26 (Fig.2) and respective controllers 30 connected by connections 32 with a network bus 24 and gateway or "network interface" 22 (Fig.1). The network interface interprets messages from the supervisory control system (computer) 20 and converts and distributes this information to the actuator controllers. The network interface also converts and transmits information originating from the actuator, e.g., position and status, to the control system (c.4, lines 23-30). The network interface also converts and transmits information originating from the actuator, e.g., position and status, to the control system (c.4, lines 23-30). Such a LAN network as in Spinner is desirable as a means of communication between a central host controller and a series of actuators (c.2, lines 49-52).

Regarding (2), Gerard teaches a linear motor and servo loop drive circuit (Fig.1) including an amplifier 40 which supplies current to the coil 28 (c.3, lines 40-41).

Regarding (3), Mizutani teaches a servo motor integral with its control apparatus. Specifically, printed circuit board 58 is fitted to a portion extending in the radial direction of bearing 5 from the housing 51b and is loaded with power circuit 31 and signal processing circuit 24. A printed circuit board 60 is layered with the printed circuit 58 via a spacer 33 and is loaded with control circuit 32 and fixed to chassis 51 (c.6, lines 42-49). Among other advantages (c.11, lines 6-67), the integration of the control with the motor does not require sockets and terminals (c.8, lines 41-43); the heat generated by switching loss, etc., of the transistors in the power circuit may be transmitted to cooling fins, to improve cooling efficiency (c.8, lines 53-59); and water and/or oil is prevented from entering parts of the circuit (c.9, lines 16-20; 30-41).

It would have been obvious to one of ordinary skill at the time of the invention to modify Sudo and provide: 1) a network interface per Spinner since this would have been a desirable means of establishing communication between a central host and an actuator; 2) an amplifier in the drive control per Gerard since amplifiers would have been desirable to supply current to the coils; and 3) a control system integrated with the associated rotary-linear motor into an single module per Mizutani since this would have been desirable to facilitate assembly, improve cooling efficiency and prevent water and/or oil from entering.

Regarding the remaining claims, see the discussion in relevant sections of above.

5. Claims 1-4, 7-10 and 16-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kemmer in view of Lee (US 4,692,678) and Mizutani (US 5,532,533). Kemmer teaches an integrated rotary-linear actuator system, comprising: a plunger (rotor 3) movable along and rotatable about a longitudinal axis extending through the plunger (and shaft 6); a coil system

having coils S1-S8 arranged to, when energized, interact with the plunger to move the plunger in at least one of a rotational mode and in a linear mode (abstract); an amplifier (part of inverter with outputs A1-A8; Fig.4) coupled to the coils and operative to provide electrical energy to energize the coils; and a control system coupled with the amplifier (converter/decoder with input; Fig.4).

Kemmer does not teach: 1) a network interface operative to receive control information from the actuator; and 2) the control system and associated rotary-linear motor "integrated into an single module."

Regarding (1), Lee teaches a motor closed-loop servo system including a plunger servo-motor Z with armature 18 and plural field coils 15/16 (Fig.5) coupled to a power amplifier Y (Fig.3), and a control system X coupled with the amplifier, the control system X having a network interface operative to receive correction or control signal information from control computer W (c.5, lines 14-25), the control system X being operative to control current signals (signals Q and T from amplifier Y) to the coils 15/16 to effect precise movement of the armature 18 based on the control information received from the computer W via the network interface (c.5, lines 14-25). Lee's integrated system provides a linear motor with a great degree of flexibility, efficiency, and accuracy required in sensitive instruments such as optics, lasers, guidance, robotic and medical perfusion technologies (c.2, lines 13-29).

Regarding (2), Mizutani teaches a servo motor integral with its control apparatus to eliminate sockets and terminals (c.8, lines 41-43); improve cooling efficiency (c.8, lines 53-59); and prevent water and/or oil from entering (c.9, lines 16-20; 30-41).

It would have been obvious to one having ordinary skill to modify Kemmer's motor and provide: 1) an integrated servo control system including a network interface of Lee since this would have provided the motor with a desirable degree of flexibility, efficiency and accuracy; and 2) a control system integrated with the associated rotary-linear motor into an single module per Mizutani since this would have been desirable to facilitate assembly, improve cooling efficiency and prevent water and/or oil from entering.

Regarding claims 2 and 16, though Kemmer teaches only one magnet or "motor", duplication of parts of an invention, i.e., providing an "array of magnets" such that plural motors are provided, has been held to involve ordinary skill. St. Regis Paper Co. v. Bemis Co. 193 USPQ 8, (7th Cir.1977).

Regarding claim 4, the motor support (tube 7) in Kemmer comprises a bearing support and a housing that define a well operative to receive the plunger (rotor 3), the plunger being supported by bearings 4 located between the plunger and the bearing support, such that the plunger is axially movable along the longitudinal axis between a retracted position and an extended position and rotatable about the longitudinal axis (Fig.1).

Regarding claims 7-10, Lee's interface inherently includes a network protocol connecting it with various internal computer hardware via a bus (Fig.4), and the interface X includes various sensors transmitting voltage magnitude, current, displacement and velocity signals A-F to the computer via the network interface (Fig.3). Algorithms or programs are run by the computer (c.2, lines 7-12).

Regarding claims 17-21, the method is carried out by the apparatus of Kemmer and Lee. Lee in particular teaches the data transfer method between the computer W and motor Z via interface X.

6. Claims 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo et al. (US 4,644,205) in view of Lee and Mizutani. Sudo teaches a rotary-linear actuator system, comprising: a motor support (stationary member 12) having a well (Fig.2); a plunger (floating member 14) supported for movement in at least part of the well so as to enable axial movement of the plunger relative to the well along a longitudinal axis of the plunger and rotational movement of the plunger about the longitudinal axis; an array of magnets (34a-34d/36a-36d) associated with the plunger (Fig.2); a first set of coils 42/44 (Fig.2) arranged to, when energized, apply an electric field that interacts with the array of magnets and provides an axial force to drive the plunger element in a linear mode (c.3, line 32); a second set of coils 50a-50h (Fig.2) arranged to, when energized, apply an electric field that interacts with the array of magnets and provides a tangential force to drive the plunger element in a rotational mode (c.3, line 47); and an integrated control system 66 which selectively energizes the first and second sets of coils to effect movement of the plunger in at least one of the linear and rotational modes.

Sudo does not teach: 1) a network interface operative to receive control information via an associated network; and 2) a control system "integrate[d]" with the associated rotary-linear motor "into an single module."

Regarding (1), Lee teaches a motor closed-loop servo system including a plunger servo-motor Z with armature 18 and plural field coils 15/16 (Fig.5) coupled to a power amplifier Y

(Fig.3), and a control system X coupled with the amplifier, the control system X having a network interface operative to receive correction or control signal information from control computer W (c.5, lines 14-25), the control system X being operative to control current signals (signals Q and T from amplifier Y) to the coils 15/16 to effect precise movement of the armature 18 based on the control information received from the computer W via the network interface (c.5, lines 14-25). Lee's integrated system provides a linear motor with a great degree of flexibility, efficiency, and accuracy required in sensitive instruments such as optics, lasers, guidance, robotic and medical perfusion technologies (c.2, lines 13-29).

Regarding (2), Mizutani teaches a servo motor integral with its control apparatus to eliminate sockets and terminals (c.8, lines 41-43); improve cooling efficiency (c.8, lines 53-59); and prevent water and/or oil from entering (c.9, lines 16-20; 30-41).

It would have been obvious to one having ordinary skill to modify Sudo's motor and provide: 1) an integrated servo control system including a network interface of Lee since this would have provided the motor with a desirable degree of flexibility, efficiency and accuracy; and 2) a control system integrated with the associated rotary-linear motor into an single module per Mizutani since this would have been desirable to facilitate assembly, improve cooling efficiency and prevent water and/or oil from entering.

Regarding claim 12, the communications interface of Lee would use a network protocol to connect the interface with the various computer parts via a bus (Fig.4). Regarding claims 13-15, Lee teaches algorithms performed by the computer W using various sensed parameters to generate control signas (c.7, lines 50-56).

Response to Arguments

7. Applicant's arguments with respect to claims 1-21 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Burton S. Mullins whose telephone number is 305-7063. The examiner can normally be reached on Monday-Friday, 9 am to 5 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nestor Ramirez can be reached on 308-1371. The fax phone numbers for the organization where this application or

proceeding is assigned are 305-1341 for regular communications and 305-1341 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 308-0956.

Burton S. Mullins
Primary Examiner
Art Unit 2834

bsm
April 21, 2003